Solutions.

1. (a) electric and magnetic fields (b) radio, IR, visible, UV, x-ray (c) (1/2) for the first sheet, $\cos^2 60$ for the second sheet, or ½ * ¼ = 1/8 * I (d) speed is 1.25 x 10^8 m/sec, wavelength is 200 nanometers, frequency unchanged

2. Ray diagrams in text. (a) image at 15 cm., real, inverted, m =- ½ (b) image at 20 cm, real, inverted, m=-1 (c) image at -10 cm., virtual, erect, m=+2

3. (a) 20 cm. (b) image at -20 cm, virtual, erect, m=+2. (c) 20 cm.

4. (a) 35 degrees (b) sin is bigger than one. No refraction, total internal reflection
(c) left column matches to magnifying glass, slide projector, camera
(d) Two coils around a solid piece of iron (see text for diagram). It increases or decreases the voltage and current (one up and the other down) in an alternating current
(e) fiber optics